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May 12, 1995

Re: Indian Point Unit No. 2
Docket No. 50-247

Document Control Desk
US Nuclear Regulatory Commission
Mail Station P1-137
Washington, DC 20555

SUBJECT: Response to Request for Additional Information, Proposed Emergency Action Levels (TAC No. M89926)

By letter dated December 8, 1994, the Nuclear Regulatory Commission requested additional information on the proposed upgraded Emergency Action Levels (EAL's) which we submitted by letter dated July 6, 1994. Transmitted herewith is our response to this request. Also included are replacement pages for the EAL Generation Package.

Should you have any questions regarding this matter, please contact Mr. Charles W. Jackson, Manager, Nuclear Safety and Licensing.

Very truly yours,

Stephen E. Quinn

Attachment

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A045

Indian Point 2 Emergency Action Levels

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Docket 50-247

GENERAL RAIs

Response to General RAI #1 (page 1)

As stated in the RAI, ICs are a subset of power plant conditions which represent a potential or actual radiological emergency. EALs are "a pre-determined, site-specific, observable threshold for a plant IC that **places the plant in a given emergency class.**" When a site-specific, observable threshold (EAL) is reached, entry into its associated emergency class is required irrespective of the IC from which the EAL is derived. As stated in the RAI, ICs provide criteria that may be relevant to emergency classification based on the users "judgment." Therefore, it follows that use of judgment may be required for those conditions in which no "pre-determined, site-specific, observable threshold" can be defined.

Since ICs lack "site-specific, observable thresholds" for emergency classification, for those postulated conditions in which no site specific observable threshold exists, the users judgment must be based on the generic definition of the associated emergency classification.

EAL Category 9.0 "Other" defines EALs in each emergency class which are based upon the user's judgment. Category 9.0 is used when the plant condition does not meet any of the EAL thresholds of Category 1.0 through Category 8.0 but it is determined that the plant condition meets either the emergency class definition criteria or the NUMARC/NESP-007 fission product barrier loss or potential loss criteria. To address the concerns raised by the staff in this RAI, the bases document has been revised to include each of the NUMARC/NESP-007 ICs. Specific reference to these ICs is now incorporated in the judgment EALs providing a mechanism for the user to determine how an EAL (or several diverse EALs) is related to the plant conditions of concern.

Response to General RAI #2 (page 2)

Though not specifically stated, it is inferred that this RAI is in reference to EALs 5.2.3, 5.2.4 and 5.2.5.

For any actual or imminent release, dose projections performed in accordance with IP-1007, "Dose Assessment", use of actual meteorology is specified. Therefore, implicit in the performance of any dose projection is the use of actual meteorology.

To address the staff's concern that classification based upon these EALs be as the result of an "actual or imminent" release of gaseous radioactivity, the EALs have been revised to include the "Actual or Imminent" terminology.

Response to General RAI #3 (page 2)

The Fission Product Barrier Evaluation demonstrates that the IP2 fission product barrier-based EALs are technically correct and meet the intent of NUMARC/NESP-007. To address the staff's concerns, those EALs which are derived from the Fission Product Barrier Evaluation have been annotated to indicate the fission product barrier loss/potential loss which they represent. In addition, the bases document has been revised to include the fission product barrier loss/potential loss indicators in a matrix format.

[Para. 2]
NUMARC/NESP-007 states "The presentation method shown for Fission Product Barriers was chosen to clearly show the synergism among the EALs and to support more accurate dynamic assessments." It does not state or imply that this method of presentation is necessary either to depict the synergism or to provide the ability for dynamic assessments. Rather, it is provided as a guide for the EAL writer to ensure that the selected presentation methodology properly reflects the desired synergistic quality and assessment capability. While NUMARC/NESP-007 does not define the term "dynamic assessment", it is assumed that it means the ability to evaluate fission product barrier loss and potential loss indicators under evolving plant conditions. Unlike the NUMARC/NESP-007 matrix format, the IP2 EAL presentation method places similar EALs into categories and subcategories that focus the user's attention to the specific EAL threshold that corresponds to the plant condition of concern. This provides a logical classification and escalation path of related indicators and thus allows for rapid assessment of emergency conditions associated with fission product barrier loss. It is important to note that the IP2 EAL categories and subcategories are not simply representations or abbreviations of the NUMARC/NESP-007 ICs. Rather, each IP2 category and associated subcategory is a pathway from broad indicators of potential emergency events to a set of specific threshold conditions that require emergency classification.

The EALs derived from the Fission Product Barrier Evaluation take into account the intended 'synergism' of the fission product barrier basis information which cannot be adequately addressed by the NUMARC/NESP-007 matrix format. An example would be a condition in which RCS leakage into containment is in excess of normal makeup capacity (RCS potential loss) in conjunction with a secondary side release with primary to secondary leakage in excess of technical specifications (Containment loss). Under a matrix format, this combination of conditions would require a Site Area Emergency (SAE) declaration because NUMARC/NESP-007 requires an SAE for the potential loss of the fuel clad or RCS with the loss of another barrier. This is clearly not intended. NUMARC/NESP-007 containment loss indicator #4 basis states that the Site Area Emergency associated with the containment loss indication is intended to be escalatory from RCS breaches associated with SG tube ruptures.

The Fission Product Barrier Evaluation does not rely on single indications as stated in the RAI. For the majority of the bounding conditions defined in the Fission Product Barrier Evaluation the indicators subsumed into other combinations of conditions consist of those indicators which are either:

- Completely bounded by another combination for the same indicator, or
- Are a subset of another indicator.

In the case cited (>300 μCi/cc DEI-131 in conjunction with primary system leakage > 75 gpm), the combination was omitted in the Fission Product

Barrier Evaluation because this condition would result in exceeding the 17 R/hr SAE EAL. The 17 R/hr SAE EAL is based on >300 μCi/cc DEI-131 in conjunction with primary system leakage into containment.

To address the staff's concerns, the EALs have been revised to add this combination as a specific fission product barrier EAL. This EAL has been added in light of the assumptions which are made in the derivation of the containment radiation monitor value associated with the fuel clad loss EAL as well as variables in the bounding assumptions (i.e. differences in time after shutdown and coolant volume released).

[Para. 3]
[Subpara. 1]
Loss of containment cooling will not result in a containment pressure (3.0 psig) sufficient to result in a containment isolation. In addition, procedural requirements require the containment to be vented under this condition to maintain pressure well below the isolation setpoint.

A faulted steam generator could result in a containment isolation signal. To address those conditions in which a valid containment isolation signal is not the result of a breach of the RCS, but as a result of a faulted SG inside containment, classification would be made based on EAL 4.1.1 which has been modified to address Phase "A", Phase "B" or CVI isolation failures, regardless of initiating event.

[Subpara. 2]
NUMARC/NESP-007 states in the basis for containment barrier loss #1: "Conditions leading to containment RED path result from RCS barrier and/or Fuel Clad Barrier Loss. Thus, this EAL is primarily a discriminator between Site Area Emergency and General Emergency representing a potential loss of the third barrier." Therefore, entry into Containment RED path by itself is intended to result in a General Emergency.

As stated in the IP2 PEG, in order to reach containment RED path, a containment pressure of 47 psig must be exceeded. This pressure is well in excess of the maximum pressure attained from the DBA LOCA and is greater than the maximum pressure attained for all analyzed steam line breaks inside containment specified in the IP2 FSAR. Therefore, to attain such a containment pressure, the energy source must be as a result of a severely degraded core (metal water reaction) in conjunction with RCS breach or a severe ATWS condition in conjunction with RCS breach. Per NUMARC/NESP-007 IC SS2 such an ATWS leads to imminent or potential loss of fuel clad.

Reference in this justification to core cooling and heat sink RED path has been deleted from the Fission Product Barrier Evaluation.

[Subpara. 3]
Per the IP2 EALs, core cooling RED only requires declaration of a Site Area Emergency. Justification #10 in the Fission Product Barrier Evaluation referenced in this RAI was in error and should have read "... and warrants declaration of a Site Area Emergency." The Fission Product Barrier Evaluation has been revised to correct this error and to reference the proper justifications.

[Subpara. 4]
Per the IP2 EALs, core cooling RED and functional restoration procedures not effective within 15 minutes is the threshold for a General Emergency. Justification #11 referenced in this RAI has been revised and the Fission Product Barrier Evaluation has been revised to reflect the proper references.

[Subpara. 5]
The justification was not intended to infer that a loss of RCS subcooling can only occur from a loss of RCS. Rather, that any core cooling ORANGE or RED path represents a loss of subcooling resulting from a loss of RCS. Justification #12 has been reworded to reflect the following basis.

ORANGE path core cooling is entered when either CET > 700°F or RVLIS water level < top of fuel (RED path if both conditions exist or CETs > 1200 °F). The RCS pressure corresponding to 700 °F is approximately 3100 psig. This pressure is more than 600 psig greater than the pressurizer safety valve lift pressure and 365 psig greater than the RCS safety limit. If the RCS is intact under this condition, RCS barrier loss is imminent. RCS inventory is never intentionally reduced to the top of fuel (39% RVLIS) under hot conditions or power operations. A reduction in RCS volume of this magnitude indicates a significant breach of the RCS barrier since no intentional valving configuration would result in such a decrease. Any condition which results in an inventory loss of this magnitude must be attributed to an RCS breach caused by a RCS line break or unisolated primary system discharging in excess of makeup capacity. It would be extremely poor judgment to assume that a loss of the RCS barrier has not occurred under either of these conditions. It should be noted that vessel water level below the top of fuel is considered a RCS barrier loss in the BWR fission product EALs. There is no difference in the mechanisms which could cause vessel level to drop below the top of fuel between BWRs and PWRs. Important to this basis is, for the purpose of emergency declaration, the potential release of fission products to the environment. In the case where the fuel clad is actually or potentially breached, the assumption that the fission products would be contained, even in the absence of other RCS loss indicators not immediately apparent, with vessel level below the top of fuel is inappropriate. Figure 4.16 of NUREG 1228 "Source Term Estimation During Response to Severe Nuclear Power Plant Accidents" shows how each of the critical safety functions is related to fission product barrier maintenance as regards preventing radioactivity releases. Core heat removal (core cooling) along with RCS pressure control

and RCS heat removal (heat sink) are shown to be directly related to RCS boundary maintenance.

It should also be noted that NUMARC/NESP-007 considers RED path heat sink a potential loss of RCS, yet the conditions requiring entry into this path are based on insufficient SG level and feedwater flow. These conditions are not direct threats to RCS barrier integrity but may lead to RCS pressure conditions which in turn may lead to RCS barrier breach. NUMARC/NESP-007 provides no technical basis to support how a RED path heat sink represents a potential loss of RCS boundary. It would appear that the RCS inventory loss conditions requiring entry into core cooling ORANGE or RED path are much more directly indicative of actual or potential RCS breach than is entry into RED path heat sink.

[Subpara. 6]
The Fission Product Barrier Evaluation and EALs associated with the combinations referenced have been revised to include the specified combinations: Coolant activity > 300 μCi/cc I-131 equivalent in combination with primary system leakage > 75 gpm, RCS subcooling < SI initiation setpoint due to RCS leakage, RED path Integrity or > 0.17 μCi/cc on R-42 OR > 66 μCi on R-41 due to RCS leakage.

[Para. 4]
It is still appropriate to define, where possible, distinct EALs which are indicative of multiple barrier loss/potential loss. This minimizes the time to classify while assuring multiple conditions are readily evaluated and properly classified. Based on exhaustive operator interviews, the use of a fission product barrier matrix format has been determined to be overly burdensome and confusing for the user resulting in missed or incorrect classifications. This concern has been expressed by other licensees who have attempted to implement NUMARC/NESP-007 fission product barrier EALs with only a matrix format.

Because of the complexity of the NUMARC/NESP-007 fission product barrier loss/potential loss definition of the Site Area Emergency, some licensees have attempted to deviate from NUMARC and simplify the fission product barrier loss/potential loss definition by removing the intended reduced weighting of the containment. The reduced weighting of the containment at the SAE classification is a significant part of the basis in the intended synergism between barrier loss indicators. The IP2 Fission Product Barrier Evaluation maintains this intended synergism of NUMARC while eliminating the inherent complexity. The IP2 EAL format has been validated by operating crews utilizing scenarios in the plant-specific simulator to test each EAL. The results of this validation have been documented and feedback incorporated into the EALs to further ensure their usability.

Response to General RAI #4 (page 5)

NUMARC/NESP-007 Section 3.9 states:

> *"Plant emergency operating procedures (EOPs) are designed to maintain and/or restore a set of CSFs which are listed in the order of priority of restoration efforts during accident conditions."...*
>
> *There are diverse and redundant plant systems to support each CSF. By monitoring the CSFs instead of the individual system component status, the impact of multiple events is inherently addressed, e.g. the number of operable components available to maintain the function.*
>
> *The EOPs contain detailed instructions regarding the monitoring of these functions and provides a scheme for classifying the significance of the challenge to the functions. In providing EALs based on these schemes, the emergency classification can flow from the EOP assessment rather than being based on a separate EAL assessment. This is desirable as it reduces ambiguity and reduces the time necessary to classify the event."*

As stated by NUMARC, each CSF is supported by diverse and redundant plant systems. The entry conditions for CSFSTs are also supported by diverse and redundant instrumentation. Containment RED path is not a single indicator but a defined, measurable and operationally significant condition which is known to be indicative of multiple fission product barrier losses. The IP2 EAL scheme does not rely solely on this condition to determine when a general emergency due to the loss of fission product barriers must be declared. Nor does it preclude the declaration of a general emergency based on other fission product barrier loss EALs which may or may not manifest themselves under a given condition. The IP2 EAL scheme does require classification of a General Emergency because, in and of itself, this condition represents a loss of the fuel clad, RCS barriers and a potential loss of containment barrier.

Response to General RAI #5 (page 5)

Refer to Response to General RAI #3 [Para. 3] [Subpara. 5]

SPECIFIC RAIs

Response to Specific RAI #1 (page 5)

A.

EAL # 5.1.1 has been revised to reference performance of an assessment of the release. The EAL has also been revised to include criteria requiring declaration if the assessment is not accomplished within 60 minutes.

B.

R-49 and R-54 are liquid effluent process monitors. These release paths only apply to NUMARC/NESP-007 IC AU1.1 and AA1.1. Steam dump and main steam safety valve monitors are not specified since release from these paths are dependent upon system flow rate which in turn is dependent upon the number of valves open and the RCS pressure over the duration of the release. Due to the wide range of release rates possible for a given monitor reading, no single trigger value would be appropriate. Releases from these paths are classified under the subcategory 5.2 EALs. The IP2 PEG has been revised to provide this justification.

Response to Specific RAI #2 (page 6)

EAL # 5.1.2 has been revised to reference performance of an assessment of the release. The EAL has also been revised to include criteria requiring declaration if the assessment is not accomplished within 15 minutes.

Response to Specific RAI #3 (page 7)

As stated in the basis for IC AA2 in the IP2 PEG: "There is no indication that water level in the spent fuel pool or refueling cavity has dropped to the level of the fuel other than by visual observation. Since AA2.2 addresses visual observation of fuel uncovery, EAL AA2.3 is unnecessary. Since there is no level indicating system in the fuel transfer canal, visual observation of loss of water level would also be required, EAL AA2.4 is unnecessary." Therefore, EAL 2.4.3 addresses the concerns of these example EALs.

Response to Specific RAI #4 (page 7)

The conditional "and" criteria was added to be consistent with the IC from which this EAL was derived as well as with the technical bases. As stated in NUMARC/NESP-007: "It is this impaired ability to operate the plant that results in the actual or potential degradation of the level of safety of the plant. The cause or magnitude of the increase in radiation levels is not a concern of this IC." The NUMARC AA3 IC states "...radiation levels within the facility that impedes operation of systems required to maintain..."

Therefore the intent if the IC is not to declare simply upon the existence of such a radiation level, rather, to declare if access is impeded. If access to the area is not required then access is not impeded. The IP2 PEG has been revised to reflect the EAL and bases wording.

Response to Specific RAI #5 (page 8)

EAL # 5.1.3 has been revised to reference performance of an assessment of the release. The EAL has also been revised to include criteria requiring declaration if the assessment is not accomplished within 15 minutes.

The source terms utilized to determine the values in Table 5.1 are those utilized in the IP2 dose projection procedure IP-1007, "Dose Assessment". The IP-1007 dose assessment methodology uses dose conversion factors derived from WASH-1400 inventories and RG 1.4 design base fractions. Annual average (ODCM) meteorology was applied in determining the effluent monitor values.

Response to Specific RAI #6 (page 9)

EAL # 5.1.4 has been revised to reference performance of an assessment of the release. The EAL has also been revised to include criteria requiring declaration if the assessment is not accomplished within 15 minutes.

Table 5.2 has been revised to quantify doses in rem. The term "TEDE Rate" has been changed to "External Exposure Rate". The term "CDE Thyroid Rate" has been changed to Thyroid Exposure Rate (for 1 hr. of inhalation)".

Response to Specific RAI #7 (page 10)

Refer to Response to General RAI #3 [Para. 3] [Subpara. 5] for justification of use of ORANGE or RED path core cooling as a RCS loss indicator. Use of this CSF as a RCS loss indicator is not a conservatism, but rather one of multiple indications of potential Fuel Clad and RCS barrier loss available to the user. While this CSF indicator by itself requires declaration of a Site Area Emergency, it is not inconsistent with NUMARC. For example, NUMARC/NESP-007 specifies RED path Heat Sink as both a potential loss of fuel clad and RCS barriers. Even though NUMARC/NESP-007 does not provide a basis for how RED path heat sink relates to RCS barrier potential loss, none the less, a Site Area Emergency is required based on this singular CSF.

Response to Specific RAI #8 (page 11)

In the case cited (>300 μCi/cc DEI-131 in conjunction with primary system leakage > 75 gpm), the combination was originally omitted in the Fission Product Barrier Evaluation because this condition would result in exceeding the 17 R/hr SAE EAL (refer to response to general RAI # 3, para. 3, subpara 3). The 17 R/hr SAE EAL was based on >300 μCi/cc DEI-131 in conjunction with primary system leakage into containment. However, this EAL has been added in light of the assumptions which are made in the derivation of the containment radiation monitor value associated with the fuel clad loss EAL as well as variables in the bounding assumptions (i.e. differences in time after shutdown and coolant volume released).

The Fission Product Barrier Evaluation and EALs associated with the combinations referenced have been revised to include the specified combinations: Coolant activity > 300 μCi/cc I-131 equivalent in combination with primary system leakage > 75 gpm, RCS subcooling < SI initiation setpoint due to RCS leakage, RED path Integrity, or > 0.17 μCi/cc on R-42 OR > 66 μCi on R-41 due to RCS leakage.

Regarding the combination of a primary to secondary leak in excess of the RCS barrier loss threshold (75 gpm) with unisolable release of secondary side to atmosphere and failed fuel (300 μCi/cc DEI-131), this condition would be classified as a General Emergency as cited in the RAI.

EAL 4.2.2 states:

> "Unisolated faulted (outside VC) ruptured steam generator
> AND
> Any indicators of fuel clad damage, Table 4.2"

The technical bases of this EAL states:

> "This EAL is intended to address the full spectrum of Steam Generator (SG) tube rupture events in conjunction with a loss of containment due to a significant secondary line break with actual or potential loss of the fuel clad integrity. This EAL addresses ruptured SG(s) with an unisolable secondary line break corresponding to the loss of 2 of 3 fission product barriers (RCS barrier and containment barrier) with the actual or potential loss of the third (fuel cladding). This allows the direct release of radioactive fission and activation products to the environment. Resultant offsite dose rates are a function of many variables. Examples include: coolant activity, actual leak rate, SG carry over, iodine partitioning, and meteorology.
>
> The indications utilized should be consistent with the diagnostic activities of the emergency operating procedures (EOPs), if available. This should include indication of reduction in primary coolant

inventory, increased secondary radiation levels, and an uncontrolled or complete depressurization of the ruptured SG. Secondary radiation increases should be observed via radiation monitoring of condenser air ejector discharge, SG blowdown, main steam, and/or SG sampling system. Determination of the "uncontrolled" depressurization of the ruptured SG should be based on indication that the pressure decrease in the ruptured steam generator is not a function of operator action. This should prevent declaration based on a depressurization that results from an EOP induced cooldown of the RCS that does not involve the prolonged release of contaminated secondary coolant from the affected SG to the environment. This EAL encompasses steam breaks, feed breaks, and stuck open safety or relief valves.

Table 4.2 presents fuel clad loss and potential loss indicators:

- ORANGE path in F-0.2, Core Cooling: Refer to EAL #1.1.1 basis
- RED path in F-0.3, Heat Sink: Refer to EAL #1.2.1 basis
- Coolant activity > 300 μCi/cc of I-131: Refer to EAL #2.1.2 basis
- Containment rad monitor reading > 17 R/hr: Refer to EAL #2.2.2 basis

This condition represents a loss of both RCS and primary containment with the loss or potential loss of fuel cladding and thus warrants declaration of a General Emergency."

Also, EAL 4.1.6 states:

"Either:
Any Phase "A" or Phase "B" or containment ventilation isolation valve(s) not closed when required following confirmed LOCA
OR
Inability to isolate any primary system discharging outside containment
AND
Radiological release to the environment exists as a result
AND
Any indicators of fuel clad damage, Table 4.2"

The technical bases of this EAL states:

"This EAL indicates loss of both RCS and containment with loss or potential loss of the fuel cladding and therefore warrants declaration of a General Emergency.

Failure of Phase "A" or Phase "B" or CVI valves to isolate is intended to address incomplete containment isolation that allows direct release to the environment. It represents a loss of both the RCS and containment barrier.

The criterion "Inability to isolate any primary system discharging outside containment" addresses any breach of the RCS and containment which is not protected by the Phase "A", Phase "B" or CVI systems or which results from an interfacing system LOCA (not addressed by NUMARC). No leakage threshold is specified since leaks outside containment, particularly under dynamic conditions, are difficult to quantify and may manifest themselves with diverse symptoms. Symptoms of a primary system discharging outside containment may be indicated via mass balance, decreasing RCS inventory without corresponding containment response, or area temperatures and radiation levels outside containment. It is for this reason that Senior Watch Supervisor/Emergency Director judgment is intended to be used in evaluating this criteria. However, it is intended that the magnitude of the leak associated with this EAL be consistent with the RCS barrier loss threshold of 75 gpm or greater.

Table 4.2 presents fuel clad loss and potential loss indicators:

- ORANGE path in F-0.2, Core Cooling: Refer to EAL #1.1.1 basis
- RED path in F-0.3, Heat Sink: Refer to EAL #1.2.1 basis
- Coolant activity > 300 μCi/cc of I-131: Refer to EAL #2.1.2 basis
- Containment rad monitor reading > 17 R/hr: Refer to EAL #2.2.2 basis"

The condition described in the RAI would be classifiable under either of these EALs.

Response to Specific RAI #9 (page 13)

Phase "A", Phase "B" and Containment Ventilation Isolation (CVI) valves are those valves associated with the Phase "A", Phase "B" and CVI isolation logic. Phase "A", Phase "B" and CVI are protective subsystems of the Containment Isolation System (CIS) designed to close containment isolation valves in those systems which either come into direct contact with primary pressure or the containment atmosphere and penetrate the containment barrier. These valves are designed to close under conditions which are indicative of a LOCA (any automatic SI signal - Phase A & CVI or requiring containment spray - Phase B & CVI). Failure of one or more of these valves to close following a confirmed LOCA does not by itself provide a pathway outside containment. As long as one valve in the line is closed, or if both valves fail to close but no downstream pathway exists, classification under this EAL would not be required. The criterion "AND Radiological pathway to the environment exists" provides this discriminator. There is no interface between the Phase "A", Phase "B" and CVI systems but each is comprised of diverse systems which provide the containment isolation function under LOCA conditions. The determination of the existence of a LOCA is consistent with the diagnostic activities specified in E-0 'Reactor Trip or Safety Injection'.

The criterion "Inability to isolate any primary system discharging outside containment" addresses any breach of the RCS and containment which is not protected by the Phase "A", Phase "B" or CVI systems or which results from an interfacing system LOCA (not addressed by NUMARC). No leakage threshold is specified since leaks outside containment, particularly under dynamic conditions, are difficult to quantify and may manifest themselves with diverse symptoms. Symptoms of a primary system discharging outside containment may be indicated via mass balance, decreasing RCS inventory without corresponding containment response, or area temperatures and radiation levels outside containment. It is for this reason that Senior Watch Supervisor/Emergency Director judgment is intended to be used in evaluating this criteria. However, it is intended that the magnitude of the leak associated with this EAL be consistent with the RCS barrier loss threshold of 75 gpm or greater.

The technical bases for EALs 4.1.3 and 4.1.6 have been revised to add the clarification that it is intended that the magnitude of the leak associated with this EAL be consistent with the RCS barrier loss threshold of 75 gpm or greater.

Response to Specific RAI #10 (page 13)

As described in Response to General RAI #3 [Para. 3] [Subpara. 5], RCS inventory is never intentionally reduced to the top of fuel (39% RVLIS) under hot conditions or power operations. A reduction in RCS volume of this magnitude indicates a significant breach of the RCS barrier since no intentional valving configuration would result in such a decrease. Any condition which results in an inventory loss of this magnitude must be attributed to a RCS breach caused by a RCS line break or unisolated primary system discharging in excess of makeup capacity. It would be inappropriate judgment to assume that a loss of the RCS barrier has not occurred under this condition. Important to this basis is, for the purpose of emergency declaration, the potential release of fission products to the environment. In the case where the fuel clad is actually or potentially breached, the assumption that the fission products would be contained, even in the absence of other RCS loss indicators, with vessel level below the top of fuel is inappropriate. As stated above, it requires a significant RCS inventory loss to attain this level. Therefore, considering vessel level below the top of fuel a loss of RCS is not conservative, but appropriate.

It should also be noted that vessel water level below the top of fuel is considered a RCS barrier loss in the BWR fission product barrier EALs. There is no difference in the mechanisms which could cause vessel level to drop below the top of fuel between BWRs and PWRs.

There is also a conflict within NUMARC/NESP-007 regarding vessel water level. As stated in the RAI, NUMARC/NESP-007 would only require

declaration of an Alert due to vessel level below the top of fuel based on fission product barrier loss. The fission product barrier loss EALs only apply under power operations and hot condition. Yet system malfunction IC SS5 requires declaration of a Site Area Emergency for vessel level resulting in core uncovery when in cold shutdown or refueling modes. This would mean that without other RCS loss indicators, if the vessel level dropped to below the fuel under hot conditions, the emergency would have to be upgraded to a Site Area Emergency if the plant achieved cold conditions.

Response to Specific RAI #11 (page 14)

Refer to Response to General RAI #3 [Para. 3] [Subpara. 2]. It would be inappropriate not to declare a General Emergency based on a valid indication of containment pressure in excess of 47 psig resulting from a loss of reactor coolant, regardless of the availability of other fuel clad and RCS barrier loss EALs. It is understood that if other applicable fuel clad and RCS barrier loss indicators are available, they would serve to confirm their respective barrier losses. But NUMARC/NESP-007 does not require confirmation by multiple barrier loss indicators for a single barrier. That is, any one valid barrier loss indicator is sufficient to consider that barrier lost. The basis supporting declaration of a General Emergency upon entry into RED path containment is that it is indicative of loss of both fuel clad and RCS with potential loss of containment.

The only source of significant hydrogen concentration in containment is severe fuel damage resulting from metal-water reaction and subsequent discharge into the containment atmosphere. A containment hydrogen concentration of 4% is well into the possible uncoolable core geometry region (Figure B-10 NUREG/BR-0150, Vol. 1, Rev. 2). Failure to declare a General Emergency, based on a valid indication, under these conditions is inappropriate.

Response to Specific RAI #12 (page 16)

The actuation setpoint for the Phase "B" isolation is 24 psig. This pressure is significantly high to indicate a significant loss of coolant accident for containment pressure increases resulting from a loss of coolant accident. EAL 4.1.4 has been revised to specify a confirmed phase "B" isolation signal as a result of a loss of reactor coolant to discriminate from a severe faulting of SGs inside containment.

Table 4.1 identifies fuel clad loss indicators for use in combination with the RCS loss and the containment potential loss indicator ("Confirmed phase "B" isolation signal due to LOCA with less than minimum containment cooling safeguards equipment operating"). Table 4.2 includes fuel clad loss and potential loss indicators for use in combination with RCS loss and containment loss indicators. RED path core cooling has been added to the

fuel clad loss indicator list consistent with the fission product barrier matrix. The term "fuel clad damage indicators " was used to represent both fuel clad loss and potential loss indictors. The term 'fuel clad loss indicators" was used to represent fuel clad loss indicators only.

Response to Specific RAI #13 (page 17)

Refer to Response to General RAI #3 [Para. 3] [Subpara. 5] for justification of use of RED path core cooling as a Fuel Clad and RCS loss indicator.

NUMARC/NESP-007 Section 3.9 states:

> *"Plant emergency operating procedures (EOPs) are designed to maintain and/or restore a set of CSFs which are listed in the order of priority of restoration efforts during accident conditions."...*
>
> *There are diverse and redundant plant systems to support each CSF. By monitoring the CSFs instead of the individual system component status, the impact of multiple events is inherently addressed, e.g. the number of operable components available to maintain the function.*
>
> *The EOPs contain detailed instructions regarding the monitoring of these functions and provides a scheme for classifying the significance of the challenge to the functions. In providing EALs based on these schemes, the emergency classification can flow from the EOP assessment rather than being based on a separate EAL assessment. This is desirable as it reduces ambiguity and reduces the time necessary to classify the event."*

As stated by NUMARC, each CSF is supported by diverse and redundant plant systems. The entry conditions for CSFSTs are also supported by diverse and redundant instrumentation. Core Cooling RED path is not a single indicator but a defined, measurable and operationally significant condition which is known to be indicative of multiple fission product barrier losses. The IP2 EAL scheme does not rely solely on this condition to determine when a General Emergency due to the loss of fission product barriers must be declared. Nor does it preclude the declaration of a General Emergency based on other fission product barrier loss EALs which may or may not manifest themselves under a given condition. The IP2 EAL scheme does require classification of a General Emergency because, in and of itself, this condition represents a loss of the fuel clad, RCS barriers and a potential loss of containment barrier.

Response to Specific RAI #14 (page 18)

The conditions defined by this EAL were identified as other site specific indications of containment barrier failure that unambiguously indicate loss or potential loss of containment barrier.

Both doors open on VC airlock is a clear breach of the containment barrier. While these doors are normally interlocked to preclude this condition, an interlock failure is possible. Since IP2 Tech. Spec. allows this condition for up to 4 hrs., the 4 hr. criteria was specified. This is consistent with the NUMARC/NESP-007 philosophy not to declare events within the Tech. Spec. allowed envelope.

Inability to close containment pressure relief or purge valves which results in a radiological release path to the environment for > 4 hrs. was also identified as a clear breach of containment barrier. The containment pressure relief and purge valves may be periodically opened under routine plant operations and therefore a condition in which these valves cannot be closed, even though no automatic isolating event exists (LOCA) is possible. Since IP2 Tech. Spec. allows this condition for up to 4 hrs., the 4 hr. criteria was specified. This is consistent with the NUMARC/NESP-007 philosophy not to declare events within the Tech. Spec. allowed envelope.

Response to Specific RAI #15 (page 18)

EAL 2.2.1 has been revised to indicate > 0.17 μCi/cc on R-42 OR > 66 μCi on R-41 due to RCS leakage. Reference to coolant activity and increasing RCS leakage has been deleted. The technical bases has been revised to support this change.

This EAL is included under the "Reactor Fuel" category and "Containment Radiation" sub category since the indication is based on containment radiation monitor readings. These readings are most closely associated with the reactor fuel. The IP2 EAL presentation method places similar EALs into categories and subcategories that focus the user's attention to the specific EAL threshold that corresponds to the plant condition of concern. This provides a logical classification and escalation path of related indicators and thus allows for rapid assessment of emergency conditions associated with fission product barrier loss. It is important to note that the IP2 EAL categories and subcategories are not simply representations or abbreviations of the NUMARC/NESP-007 ICs. Rather, each IP2 category and associated subcategory is a pathway from broad indicators of potential emergency events to a set of specific threshold conditions that require emergency classification. Those EALs which are derived from the Fission Product Barrier Evaluation have been annotated to indicate the fission product barrier loss/potential loss which they represent.

Response to Specific RAI #16 (page 19)

A.

This EAL is included under the "Reactor Fuel" category and "Containment Radiation" sub category since the indication is based on containment radiation monitor readings. These readings are most closely associated with the reactor fuel. The IP2 EAL presentation method places similar EALs into categories and subcategories that focus the user's attention to the specific EAL threshold that corresponds to the plant condition of concern. This provides a logical classification and escalation path of related indicators and thus allows for rapid assessment of emergency conditions associated with fission product barrier loss. It is important to note that the IP2 EAL categories and subcategories are not simply representations or abbreviations of the NUMARC/NESP-007 ICs. Rather, each IP2 category and associated subcategory is a pathway from broad indicators of potential emergency events to a set of specific threshold conditions that require emergency classification. Those EALs which are derived from the Fission Product Barrier Evaluation have been annotated to indicate the fission product barrier loss/potential loss which they represent.

B.

NUMARC/NESP-007 does not specify that multiple fission product barrier loss indicators must be present to consider that barrier lost. The logic term used between each fission product barrier loss/potential loss indicator in Table 4 of NUMARC/NESP-007 is "OR". This means that any one indicator is sufficient to consider the barrier lost or potentially lost. Furthermore, NUMARC/NESP-007 does not state that the same indicator should not be used to indicate the loss of more than one fission product barrier.

NUMARC/NESP-007 also states in part:

> ***"5. Significant Radioactive Inventory in Containment"***
>
> *"The (site-specific) reading is a value which indicates significant fuel damage well in excess of the EALs associated with both loss of Fuel Clad and loss of RCS barriers. As stated in Section 3.8, a major release of radioactivity requiring offsite protective actions from core damage is not possible unless a major failure of fuel cladding allows radioactive material to be released from the core into the reactor coolant. Regardless of whether containment is challenged, this amount of activity in containment, if released, could have such severe consequences* ***that it is prudent to treat this as a potential loss of containment, such that a General Emergency declaration is warranted.*** *..."*

It is also important to note that it is not expected that emergency classification would be based on containment radiation alone. Provided that other indicators are available, classification would be confirmed by those redundant indicators. But, in the event of a severe accident, many of the other indicators of multiple fission product barrier loss may not be available.

Therefore, it would be appropriate to rely on this single indicator since it is indicative of multiple fission product barrier loss/potential loss.

Response to Specific RAI #17 (page 20)

A.

EAL 8.4.1 has been revised to state an "Earthquake felt inplant based upon a consensus of Control Room Operators on duty AND ..."

B.

NUMARC/NESP-007 quotes the following paragraph from the referenced EPRI guidance defining a "felt earthquake" as:

> "An earthquake of sufficient intensity such that: (a) the inventory ground motion is felt at the nuclear plant site and recognized as an earthquake based on a consensus of Control Room operators on duty at the time, **and** (b) for plants with operable seismic instrumentation, the seismic switches of the plant are activated. For most plants with seismic instrumentation , the seismic switches are set at an acceleration of about 0.01 g."

The referenced EPRI guidance clearly states that the "felt" earthquake requires both conditions by use of the boolean "AND" statement.

Response to Specific RAI #18 (page 21)

EAL 8.2.1 has been revised to state "Confirmed fire in or contiguous to any plant area, Table 8.2 not...".

Response to Specific RAI #19 (page 21)

EAL 8.1.1 has been revised to include any security event which represents a potential degradation in the level of safety of the plant.

EAL 8.1.2 has been revised to include any security event which represents an actual substantial degradation of the level of safety of the plant.

EAL 8.1.3 has been revised to include any security event which represents actual or likely failures of plant systems needed to protect the public.

EAL 8.1.1 has been revised to state "...but outside plant vital areas, Table 8.2".

Response to Specific RAI #20 (page 22)

Toxic or flammable gases do not in themselves pose any threat to the safe operation of the plant but may preclude access to areas necessary for safe operation of the plant. Therefore the concern of this EAL are concentrations which are either life threatening or preclude access to areas needed for safe plant operation. No specific thresholds have been defined since specific thresholds are dependent upon the type of toxic or flammable gas involved as well as the amount and type of personal protective equipment available to those individuals requiring access. Therefore, the determination as to whether concentrations are sufficient to be life threatening or preclude access to areas required for safe operation is left to the judgment of the user. Where specific criteria are available to the user it is expected that criteria would be considered in this evaluation.

Response to Specific RAI #21 (page 22)

EAL 7.2.3 has been revised to specify entry into AOI 27.1.9, "Control Room Inaccessibility/Safe Shutdown Control" which provides guidance for control room evacuation.

Response to Specific RAI #22 (page 23)

EAL 8.4.3 has been deleted. The example EAL from which it was derived, HU1-3 and its generic bases provides no specific guidance for declaration beyond that which the IC provides. Therefore this EAL has been subsumed into the "Other" category EAL 9.1.1. The section 8.4 EALs have been renumbered appropriately.

Response to Specific RAI #23 (page 23)

Revised EAL 7.2.5 to state "Plant control cannot be established per AOI 27.1.9..."

Response to Specific RAI #24 (page 24)

The statement "At least (site-specific) emergency generators are supplying power to emergency buses" serves no purpose. This EAL is concerned only with the loss of off-site AC power capability. If one of the emergency diesels is not supplying its emergency bus under hot conditions then an Alert would be declared based on EAL 6.1.3 (SA5). NUMARC provides no criteria for the condition in which offsite AC power capability is lost and one emergency diesel generator is not supplying it's emergency bus under cold conditions. If neither emergency diesels are supplying their emergency busses, either an

Alert would be declared based on EAL 6.1.2 or a SAE based on EAL 6.1.4, depending on plant operating mode.

Response to Specific RAI #25 (page 25)

EALs 7.3.1 and 7.3.3 have been revised to add the words "safety system annunciators or indications..."

Response to Specific RAI #26 (page 26)

A.

The term "unplanned" is not necessary. There would never be a planned loss off all onsite or offsite communications capability. For a planned outage of communications equipment, alternate communications systems would always be established.

B.

The concern of this EAL is the loss of ability to communicate such that it affects the ability to perform routine plant operations or notify offsite agencies or personnel. Because of the existence of numerous redundant communication systems which may be available, it is inappropriate to limit the criteria to a predetermined list as this may exclude other systems which may be available at the time. Also, some of the IP2 communication systems, by themselves, may not necessarily provide the all of the communications functions that are required at the time of loss (i.e. routine operations may require a combination of Gaitronics and portable radios). The EAL, as worded, is more inclusive by defining the condition as a loss of communication capability affecting the ability to communicate. The EAL technical bases has been revised to include the site specific list of communication systems identified in the IP2 PEG.

Response to Specific RAI #27 (page 26)

All DC buses would never be de-energized for any planned activity unless the reactor was defueled.

Response to Specific RAI #28 (page 27)

A.

EAL 6.1.2 mode applicability has been revised to include the defuel mode.

B.

EAL 6.1.2 has been revised to state:

> Loss of AC power to all 480 volt busses (5A, 2A/3A, 6A) for > 15 min.
> AND
> Inability to power required core cooling/spent fuel cooling systems with alternate power sources for > 15 min.

Response to Specific RAI #29 (page 28)

EAL 1.1.1 and it's associated technical bases have been revised to be consistent with the NUMARC/NESP-007 criteria.

Response to Specific RAI #30 (page 29)

The IP2 Technical Specifications do not specify required functions to maintain cold shutdown. EAL 7.2.4 is derived from IC SA3 which states: "Inability to Maintain Plant in Cold Shutdown." The anticipatory criteria is provided in the use of the term "cannot be maintained." The definition section of the Technical Bases Document defines the term as follows: "The value of the identified parameter(s) is not able to be kept above /below specified limits. This determination includes making an evaluation that considers both current and future system performance in relation to the current value and trend of the parameter(s). Neither implies that the parameter must actually exceed the limit before the action is taken nor that the action must be taken before the limit is reached." NUMARC/NESP-007 "Questions and Answers" published in June 1993 defines the term 'function' as : "The action which a system, subsystem or component is designed to perform." The evaluation of both current and future system performance (function) is inherent in this definition of "cannot be maintained."

Response to Specific RAI #31 (page 30)

The concern of NUMARC IC SS1 and this EAL is the loss of ability to provide AC power to the safeguards busses and their vital loads. A condition can exist where the supply transformers and/or emergency diesel generators are available but a fault on the bus precludes powering vital loads. Therefore it is more appropriate and inclusive to define the EAL by the inability to power the safeguards buses rather than the loss of the power sources.

Response to Specific RAI #32 (page 31)

EAL 1.1.2 and it's associated technical bases have been revised to be consistent with the NUMARC/NESP-007 criteria.

Response to Specific RAI #33 (page 31)

IP2 Technical Specifications Section 1.2 defines hot shutdown as: Reactivity within the limits of Figure 3.10-1 and Tavg > 200 °F and < 555 °F. As stated in the RAI, EAL 1.1.2 addresses loss of reactivity control. The NUMARC/NESP-007 basis for SS4 also states that the EAL is intended addresses loss of functions, including ultimate heat sink. No reference to core cooling is made. However, EAL 1.2.1 and EAL 3.1.3 provide for the declaration of a Site Area Emergency under conditions which loss of functions threaten core cooling. It is also important to differentiate between function and operability of components or equipment which support a function. NUMARC/NESP-007 "Questions and Answers" published in June 1993 defines 'function' as: "The action which a system, subsystem or component is designed to perform. Safety functions, as applied to PWRs are reactivity control, RCS inventory control and secondary heat removal." NUMARC/NESP-007 Section 3.9 states "There are diverse and redundant plant systems to support each CSF. By monitoring the CSFs instead of the individual system component status, the impact of multiple events is inherently addressed, e.g., the number of operable components available to maintain the function." Since it would be impossible to define all possible losses of system component operability under which loss of function may occur, consistent with Section 3.9 of NUMARC/NESP-007, the loss of function is defined by CSF status. For secondary heat removal, that CSF is RED path heat sink. The Technical bases document has been revised to reflect that EALs 1.1.2, 1.2.1 and 3.1.3 also serve to support IC SS4.

Response to Specific RAI #34 (page 32)

The EAL does not imply that the reactor vessel head can be removed while in hot condition. Since this configuration would never occur under hot conditions, that portion of the EAL based on visual observation would not apply or be evaluated.

As stated in the RAI, one of the NUMARC ICs from which EAL 3.1.3 is derived is NUMARC IC SS5: "Loss of Water Level in the Reactor Vessel That Has or Will Uncover Fuel in the Reactor Vessel." There are numerous conditions which can lead to a loss of RCS inventory to the extent resulting in core uncovery while in cold shutdown or refuel modes. The one addressed in the generic bases for PWRs is "sequences such as prolonged boiling following loss of decay heat removal." Loss of inventory can also occur as a result of drain down events. The concern of this IC and EAL is uncovery of the fuel, regardless of the cause. Therefore the criteria regarding loss of decay heat

removal serves no function. The EAL wording "RVLIS cannot be maintained..." provides for the anticipatory criteria.

The mode applicability was expanded to include the inability to maintain RVLIS above top of fuel consistent with use of RVLIS level as a fuel clad barrier potential loss and RCS barrier loss indicator. Refer to Response to Specific RAI #10.

The RAI makes reference to local high power densities which can "uncover" fuel and cause fuel damage without loss of RCS inventory. While this may be true, this EAL makes no reference to local fuel uncovery. Rather, this EAL addresses loss of inventory indicated by RVLIS. Local uncover would not be observable by RVLIS. Refer to Response to Specific RAI #10 for justification for use of RVLIS indication as a loss of RCS.

Response to Specific RAI #35 (page 33)

EAL 7.3.4 has been revised to state "...AND Loss of ability to monitor critical safety function status...". The words "Complete" and "all" have been deleted. The IP2 PEG has been revised to list critical safety functions rather than plant parameters to monitor critical safety functions.

Response to Specific RAI #36

A.

The wording "is not likely" has been added to EAL 6.1.5 regarding restoration of power.

The wording has been revised to reflect the wording: "Actual or imminent entry into ORANGE or RED path on F-0.2 Core Cooling."

B.

The concern of NUMARC IC SG1 and this EAL is the loss of ability to provide AC power to the safeguards buses and their vital loads. A condition can exist where the supply transformers and/or emergency diesel generators are available but a fault on the bus precludes powering vital loads. Therefore it is more appropriate and inclusive to define the EAL by the inability to power the safeguards buses rather than the loss of the power sources

Refer to the attached letter "Station Blackout Rule 10 CFR 50.63" dated 4/14/89 for the source of the 1 hr. SBO coping time.

Response to Specific RAI #37

EAL 1.1.3 has been revised to include the core cooling OR heat removal logic by inclusion of RED path core cooling in combination with RED path Subcriticality. EAL 1.3.2 has been subsumed into the Subcriticality sub-category since this is the common condition in combination with either core cooling or heat sink.